(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 967 775 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.12.1999 Bulletin 1999/52

(51) Int Cl.6: **H04M 3/42**

(21) Application number: **99304671.3**

(22) Date of filing: **15.06.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **23.06.1998 US 103021**

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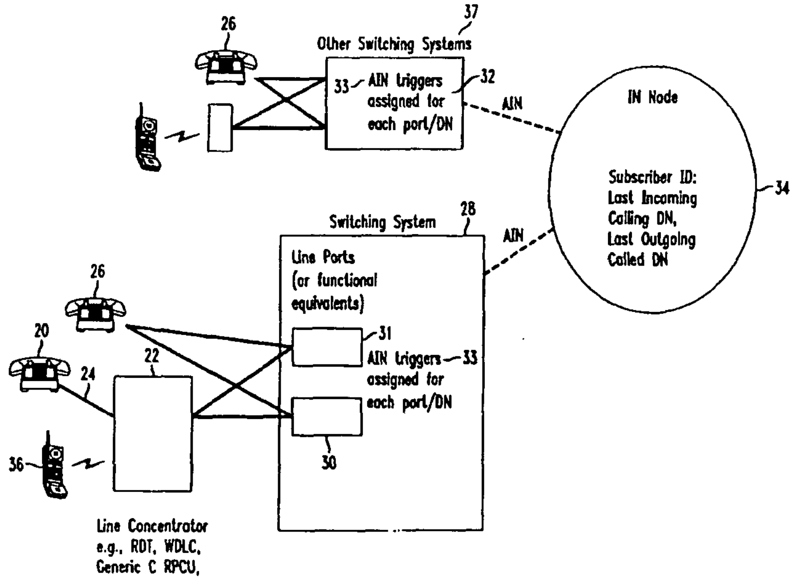
(54) Method and apparatus for tracking call history for mobile and wireline users accessing the network on different ports for subsequent calls

(57) This invention provides a method and apparatus for associating call data with particular users instead of line ports. This call data includes the last incoming and outgoing calls associated with a particular number. This allows the services such as automatic callback, automatic recall, and customer originated trace to be implemented with dynamic line assignment allowing users to maintain the same level of subscribed services at different locations. For mobile users, automatic callback, automatic recall, and customer originated trace can be implemented at the home mobile switching center as well as roaming mobile switching centers. If the mobile user is roaming, updating the call history of the mobile station at the new mobile switching center allows the mobile user to experience seamless services across a large territory.

FIG. 2


26
37
Other Switching Systems
33
AIN triggers assigned for each port/DN
32
AIN
IN Node
Subscriber ID: Last Incoming Calling DN, Last Outgoing Called DN
34
Switching System
28
AIN
Line Ports (or functional equivalents)
26
20
24
22
31
AIN triggers
33
assigned for each port/DN
30
36
Line Concentrator e.g., RDT, WDLC, Generic C RPCU,

Printed by Jouve, 75001 PARIS (FR)

Description

Field of the Invention

[0001] This invention relates to the tracking of call history for wireline users and updating this information at new switches as dynamic line assignment is employed. This invention also applies to mobile users as call history is transferred between mobile switching centers as a mobile user roams.

Background

[0002] Currently, there are several services offered by telecommunication providers where previous call history from the line port used by the subscriber is used as input data. Examples of these services include automatic callback, automatic recall, and customer originated trace. The automatic callback service allows a user to place a call to the *last party that called the user.* The automatic recall service allows a user to place a call to the *same number the user last called.* And, the customer originated trace allows a user to request an automatic trace of the last incoming call. For these types of services, saving the call history of a user is accomplished by saving the call history data as it relates to a particular line port.

[0003] There is a need to store call history related to users versus line ports. This is important because certain categories of users may not use the same line ports for subsequent calls. These users include mobile subscribers served via a pool of lines at the central office, wireline subscribers served via pool of lines at the central office where there are many subscribers in relation to a fewer number of ports (possibly for economic reasons in the case of competitive access providers), personal mobility service via wire line phones (smart cards that identify the person on "public" phones), and mobile subscribers on a mobile switching center where line ports are not used. Therefore, a need exists to track and store call history as it relates to a subscriber number rather than a line port.

Summary

[0004] This invention provides a method and apparatus for associating call data with particular users instead of line ports. This call data includes the last incoming and outgoing calls associated with a particular number. This allows the services such as automatic callback and automatic recall and customer originated trace to be implemented without regard to the line port allowing users to maintain the same level of subscribed services at different locations.

[0005] For mobile users, automatic callback and automatic recall and customer originated trace can be implemented at the home mobile switching center as well as roaming mobile switching centers. If the mobile user is roaming at least two schemes can be deployed for updating the mobile switching center with call history information. First, when the mobile station registers with a mobile switching center, the previous mobile switching center transmits the call history to the new mobile switching center. Second, when the mobile station registers with a mobile switching center, the home location register or the wireless intelligent network obtains the call history information from the previous mobile switching center and transmits this information to the new mobile switching center.

Brief Description of the Drawings

[0006] The summary of the invention, as well as the following detailed description of preferred embodiments, is better understood when read in conjunction with the accompanying drawings, which are included by way of example, and not by way of limitation with regard to the claimed invention.

[0007] Figure 1 illustrates a prior art block diagram of a switching system with the call history associated with the line ports.

[0008] Figure 2 illustrates a block diagram of tracking the call history for an intelligent network node.

[0009] Figure 3 illustrates a block diagram of tracking the call history for wireless subscribers via a wireless intelligent network node service control point.

[0010] Figure 4 illustrates a block diagram for transferring call history information to the various mobile switching centers.

[0011] Figure 5 illustrates a message flow diagram for call origination and termination and the associated updating of call history information for an intelligent network node.

[0012] Figure 6 illustrates a message flow diagram for automatic callback service when a user employing dynamic line assignment moves to a new switch.

[0013] Figure 7 illustrates a message flow diagram for automatic recall service when a user employing dynamic line assignment moves to a new switch.

[0014] Figure 8 illustrates a message flow diagram for call origination and termination and the associated updating of call history information for a wireless intelligent network node.

[0015] Figure 9 illustrates a message flow diagram for automatic callback service when a mobile user moves to another mobile switching center.

[0016] Figure 10 illustrates a message flow diagram for automatic recall service when a mobile user moves to another mobile switching center.

[0017] Figure 11 illustrates a message flow diagram for storing and updating call history information in the mobile switching center/visitor location registry.

[0018] Figure 12 illustrates a message flow diagram for a first scheme for transferring call history information to another mobile switching center/visitor location registry.

[0019] Figure 13 illustrates a message flow diagram for a second scheme for transferring call history information to the mobile switching center/visitor location registry.

Detailed Description of Preferred Embodiment

[0020] Figure 1 illustrates a prior art block diagram of a switching system with the call history associated with the line ports. In prior art systems, subscriber telephones 10 are connected via twisted pair lines 12 to line ports 14 located in the switching system 16. Each line port 14 is connected and associated with a specific subscriber's telephone line 12. Call history information is stored in the switching system's memory and associates call history information such as last called number and last calling number with each line port ID 18.

[0021] Figure 2 illustrates a block diagram of a switching system with an intelligent network based call history. A subscriber's telephone 20 is connected to a line concentrator 22 containing a plurality of line cards or port via a twisted pair 24. A line concentrator 22 is an interface that allows low-usage subscriber lines to connect to the high-usage channels. Other telephones 26 and the line concentrators 22 are connected to the switching systems 28 at line ports 31 and 32. The switching system 28 can store into memory information regarding the tracking of each telephone independent of the line card or port. Each switching system 28 can support a plurality of line ports 30 and 31. Advanced intelligent network triggers 33 are assigned to each line port 30. The switching system 28, as well as other switching systems 37 are connected to an intelligent network node 34. The intelligent network node 34 assists in the transfer and storage of call history information such as the subscriber ID, last incoming calling dialed number, and the last outgoing called dialed number.

[0022] For example, as a user 36 disconnects from switching system 28, the call history information that is associated with a particular subscriber is tracked by the intelligent network node 34 via originating and terminating triggers. As other users 20 attempt to access the switching system 28, the line port 30 previously used by user 36 is now available to user 20 at the switching system 28. Since the intelligent network node 34 is tracking the call history of the users and not the line ports, hardware can be optimized across the switching system 28.

[0023] Figure 3 illustrates a block diagram of tracking the call history for wireless subscribers via a wireless intelligent network. When mobile user 38 connects to the mobile switching center (MSC) 40 through the base station 42, wireless intelligent network triggers are sent to the wireless intelligent network node service control point (WIN/HLR) 44 by the MSC 40. As the mobile user 38 travels to a point where the mobile switching center 40 terminates service and transfers the service of the user 38 to a different MSC 46, the WIN/SCP 44 updates the call history and any additional information from the home location register (HLR) to the new MSC 46. This information is provided to and from the WIN/SCP 44 by originating and terminating triggers.

[0024] Figure 4 illustrates a block diagram for transferring call history information to the various mobile switching centers. When a mobile user turns on the cellular telephone (mobile station) 50, a registration message is sent from the mobile station 50 to the base station 52. A series of base stations are connected to a MSC 54.

[0025] When the mobile user places or receives a telephone call, the call history information is updated in the MSC 54. When the mobile station 50 moves to the outer range of the MSC 54, the mobile station 50 registers on the MSC 60 that is closest and capable of supporting the mobile station 50. The MSC 60 sends a registration message to the WIN/SCP 56.

[0026] There are at least two schemes for transferring call history information to the new MSC 60. First, the WIN/HLR 56 informs the second MSC 60 of the location of the most recent VLR for the mobile station 50 specifying the MSC 54. The MSC 60 sends a request to the MSC 54 for the most recent VLR and call history associated with mobile station 50. This information is sent by the MSC 54 to the MSC 60 and MSC 54 deletes the VLR corresponding to mobile station 50.

[0027] Second, the WIN/HLR 56 builds a new VLR for the mobile station 50 at the second MSC 60. A cancellation message is sent from the WIN/HLR 56 to the first MSC 54. As part of cancellation, the MSC 54 transmits the call history associated with the mobile station 50 to the WIN/HLR 56. The second MSC 60 receives the VLR including the call history from the WIN/HLR 56.

[0028] Figure 5 illustrates a message flow diagram for call origination and termination and the associated updating of call history information. When a user 100 receives an incoming call from another party on the PSTN 102 and the call is terminated 103 to switch B 106. Switch B 106 sends a termination message 107 with the calling digits to the intelligent network node 108. The intelligent network node 108 updates the call history information 111 with the telephone number of the other party who called the user 100. A trigger response 109 is sent by the intelligent network node 108 to switch B 106. Switch B 106 terminates the call 110.

[0029] When the user 100 originates a call 112, an origination trigger with the called number 114 is sent by switch B 106 to the intelligent network node 108. The intelligent network node 108 updates the call history information with the called number 116. The intelligent network 116 transmits a trigger response to switch B 106 and the origination call 120 is placed on the PSTN 102.

[0030] Figure 6 illustrates a message flow diagram for automatic callback service when a user employing dynamic line assignment moves to a new switch. With dynamic line assignment, a subscriber to a particular set of services has access to those services at different locations. For example, a subscriber who has subscribed to automatic call back service at home, can have that service while on a business trip. When the user 100 from Figure 5, invokes the automatic call back service at another location, an origination signal 122 is sent to switch A 124. Switch A 124 transmits an origination trigger 126 to the intelligent network node 108. The intelligent network node 108 recognizes the automatic call back service code, and retrieves the last incoming dialed number for user 100. The intelligent network node 108 transmits a trigger response with the last incoming dialed number 128 to switch A 124. Switch A 124 places the origination call 130 to the last dialed number.

[0031] Figure 7 illustrates a message flow diagram for automatic recall service when a user moves to a new switch. When the user 100 from Figure 7, invokes the automatic recall service at another location, an origination signal 132 is sent to switch A 124. Switch A 124 transmits an origination trigger 134 to the intelligent network node 108. The intelligent network node 108 recognizes the automatic recall service code, and retrieves the last outgoing dialed number for user 100. The intelligent network node 108 transmits a trigger response with the last outgoing dialed number 136 to switch A 124. Switch A 124 places the origination call 138 to the last dialed number.

[0032] Figure 8 illustrates a message flow diagram for updating and tracking call history information in a wireless network. When a mobile user 200 receives an incoming call from another party on the PSTN 202 and the call is terminated 203 to MSC B 204, MSC B204 transmits a termination message 207 with the calling digits to the wireless intelligent network node 208. The wireless intelligent network node 208 updates the call history information 211 with the telephone number of the other party who called the user 200. A trigger response 209 is sent by the wireless intelligent network node 208 to MSC B 206. MSC 206 terminates the call 210.

[0033] When the user 200 originates a call 212, an origination trigger with the called number 214 is sent by MSC B 206 to the wireless intelligent network node 208. The wireless intelligent network node 208 updates the call history information with the called number 216. The wireless intelligent network 216 transmits a trigger response to MSC B 206 and the origination call 220 is placed on the PSTN 202.

[0034] Figure 9 illustrates a message flow diagram for automatic callback service when a mobile user moves to another MSC. When the mobile user 200 from Figure 8, invokes the automatic call back service at another location, an origination message 222 is sent to MSC A 224. MSC A 224 transmits an origination trigger 226 to the wireless intelligent network node 208. The wireless intelligent network node 208 recognizes the automatic call back service code, and retrieves the last incoming dialed number for user 200. The wireless intelligent network node 208 transmits a trigger response with the last incoming dialed number 228 to MSC A 224. MSC A 224 places the origination call 230 to the last dialed number.

[0035] Figure 10 illustrates a message flow diagram for automatic recall service when a mobile user moves to another MSC. When the mobile user 200 from Figure 8, invokes the automatic recall service at another MSC, an origination message 222 is sent to MSC A 224. MSC A 224 transmits an origination trigger 226 to the wireless intelligent network node 208. The wireless intelligent network node 208 recognizes the automatic recall service code, and retrieves the last outgoing dialed number for user 200. The wireless intelligent network node 208 transmits a trigger response with the last outgoing dialed number 228 to MSC A 224. MSC A 124 places the origination call 230 to the last dialed number.

[0036] Figure 11 illustrates a message flow diagram for storing call history information in the mobile switching center/visitor location registry (MSC/VLR). When a mobile user 300 receives an incoming call from another party on the PSTN 302 and the call is terminated 303, MSC/VLR B 306 stores the last incoming call into the call history infomation for the mobile user 300. The MSC/VLR 306 updates the call history information 311 with the telephone number of the other party who called the mobile user 300. The MSC/VLR 306 terminates the call 310.

[0037] When the mobile user 300 originates a call 312, the MSC/VLR 306 updates the call history information with the called number 314. The MSC/VLR 306 places origination call 316 to the PSTN 302.

[0038] Figure 12 illustrates a message flow diagram for a first scheme for transferring call history information to another mobile switching center. When the mobile station 300 registers with the new MSC/VLR A 304, a user ID 317 is sent from the mobile station to the MSC/VLR A 304. The MSC/VLR A 304 transmits a registration notification message 318 to the home location registry (HLR) 320. The HLR 320 replies with a registration response 322 including data to build the VLR and the last registered VLR for the mobile station 300. MSC/VLR A sends a request for call data 324 based on the instructions from the HLR 320 to MSC/VLR B 306. A call data response message 326 from the MSC/VLR B 306 is sent to the MSC/VLR A 304 with the last incoming and outgoing call data. Once received at the MSC/VLR A 304, the HLR 320 sends a registration cancellation message 328 to MSC/VLR B 306.

[0039] Figure 13 illustrates a message flow diagram for a second scheme for transferring call history information to the mobile switching center. When the mobile station 300 registers with the new MSC/VLR A 304, a user ID 330 is sent from the mobile station to the MSC/VLR A 304. The MSC/VLR A 304 transmits a registration notification message 332 to the home location registry (HLR) 320. The HLR 320 replies with a registration response 334 including data to build the VLR for the mobile station 300. The HLR 320 sends a request 336 for call data to the MSC/VLR B 306. The MSC/VLR B 306 transmits the call data 338 including the last incoming and outgoing calls to the HLR 320. The HLR 320 forwards 340 this data to the MSC/VLR A 304. The HLR 320 also sends a registration cancellation message 342 to the MSC/VLR B 306.

[0040] While exemplary systems and methods embodying the present invention are shown by way of example, it will be understood, of course, that the invention is not limited to these embodiments. Modifications may be made by those skilled in the art, particularly in light of this disclosure. For example, each of the elements of the disclosed embodiments may be utilized alone or in combination with elements of the other embodiments.

Claims

1. A method for tracking call history information for a telephone in a telecommunication network, comprising:

    transmitting from the telephone a first message comprising information for dynamically tracking the telephone independent of the line card, to a switch capable of dynamically assigning the telephone to a line card interface;
    storing into memory at the switch a first set of information referencing the telephone;
    transmitting a second message comprising a second set of information referencing call history of the telephone from the switch to a network node; and
    transmitting a third message comprising a third set of information referencing the call history of the telephone from the network node to the switch.

2. A method for tracking call history information for a mobile station in a telecommunication network, comprising:

    transmitting a first registration message from the mobile station to a first mobile switching center;
    transmitting a second message requesting call history information from the first mobile switching center be sent to a network node;
    transmitting a third message requesting the second mobile switching center to transmit the call history information to the first mobile switching center from the network node to a second mobile switching center; and
    transmitting a fourth message comprising the call history information associated with the mobile station, from the second mobile switching center to the first mobile switching center.

3. A method for tracking call history information for a mobile station in a telecommunication network, comprising:

    transmitting a first registration message from the mobile station to a first mobile switching center;
    transmitting a second message requesting call history information from the first mobile switching center be sent to a network node;
    transmitting a third message requesting the second mobile switching center to transmit the call history information to the first mobile switching center from the network node to a second mobile switching center; and
    transmitting a fourth message comprising the call history information associated with the mobile station, from the second mobile switching center to the first mobile switching center; and
    transmitting a fifth message comprising the call history information associated with the mobile station, from the network node to the first mobile switching center.

4. A method for tracking call history information in a telecommunication network, comprising:

    registering a mobile station at a first mobile switching center;
    transmitting a registration message from the first mobile switching center to a network node requesting mobile station information;
    transmitting the mobile station information from the network node to the first mobile switching center;
    creating a visitor location registry at the first mobile switching center from the mobile station information;
    transmitting a first set of called number digits from the mobile station to the first mobile switching center;
    storing in memory the first set of called number digits at the first mobile switching center;
    establishing a first communication path between the mobile station and a first called number corresponding to the first set of called number digits; and
    transmitting an off-hook message from the mobile station to the first mobile switching center.

5. A method for tracking call history information for a telephone in a telecommunication network, comprising:

    transmitting an off-hook message from a first telephone connected to a first load office switch;
    receiving an off-hook message at the first local office switch from the first telephone;
    recalling from memory in the first local office switch, call history information corresponding to the first telephone;

transmitting called number digits from the first telephone; and
storing into the first load office switch's memory the called number digits.

6. An apparatus for tracking call history information for a mobile station in a telecommunication network, comprising:

the mobile station having means for registering with a first and second mobile switching center;
the first mobile switching center having means for storing a visitor location registry and call history information for the mobile station while the mobile station is registered; and
the second mobile switching center having a means for transmitting to a network node a request for the visitor location registry and the call history information for the mobile station to be transferred from the first mobile switching center to the second mobile switching center when the mobile station transfers its registration from the first mobile switching center to the second mobile switching center.

7. A computer useable medium having computer executable instructions for access by an application program being executed on telecommunication equipment, comprising:
the computer medium having computer readable program code embodied in the computer medium for transferring call history information to the telecommunication equipment, the computer readable program code comprising:

computer readable program code means for transmitting an outgoing call from a telephone to the telecommunication equipment, where the telecommunication equipment is capable of dynamic line assignment;
computer readable program code means for requesting call history information by the telecommunication equipment from an intelligent network node; and
computer readable program code means for transmitting the call history information from the intelligent network node to the telecommunication equipment.

8. A computer useable medium having computer executable instructions for access by an application program being executed on mobile switching center equipment, comprising:
the computer medium having computer readable program code embodied in the computer medium for transferring call history information to the mobile switching center equipment, the computer readable program code comprising:

computer readable program code means for transmitting mobile station registration information from a mobile station to the mobile switching center equipment;
computer readable program code means for requesting call history information by the mobile switching center equipment from a wireless intelligent network node; and
computer readable program code means for transmitting the call history information from the wireless intelligent network node to the mobile switching center equipment.

9. An apparatus for tracking call history information for a mobile station in a telecomnunication network, comprising:

means for receiving messages from the mobile station;
means for registering the mobile station with a first and second mobile switching center;
the first mobile switching center having means for storing a Visitor location registry and call history information for the mobile station while the mobile station is registered; and
the second mobile switching center having a means for transmitting to a network node a request for the visitor location registry and the call history information for the mobile station to be transferred from the first mobile switching center to the second mobile switching center when the mobile station transfers its registration from the first mobile switching center to the second mobile switching center.

10. An apparatus for tracking call history information for a telephone in a telecommunication network, comprising:

means for connecting the telephone to a switch;
means for connecting the switch to a communication network;
means for dynamically registering the telephone with the switch by using the means for connecting the telephone to the switch as the interface between the telephone and the switch; and
means for tracking the call history information for the telephone independent of the means for connecting the telephone to the switch.

FIG. 1
PRIOR ART

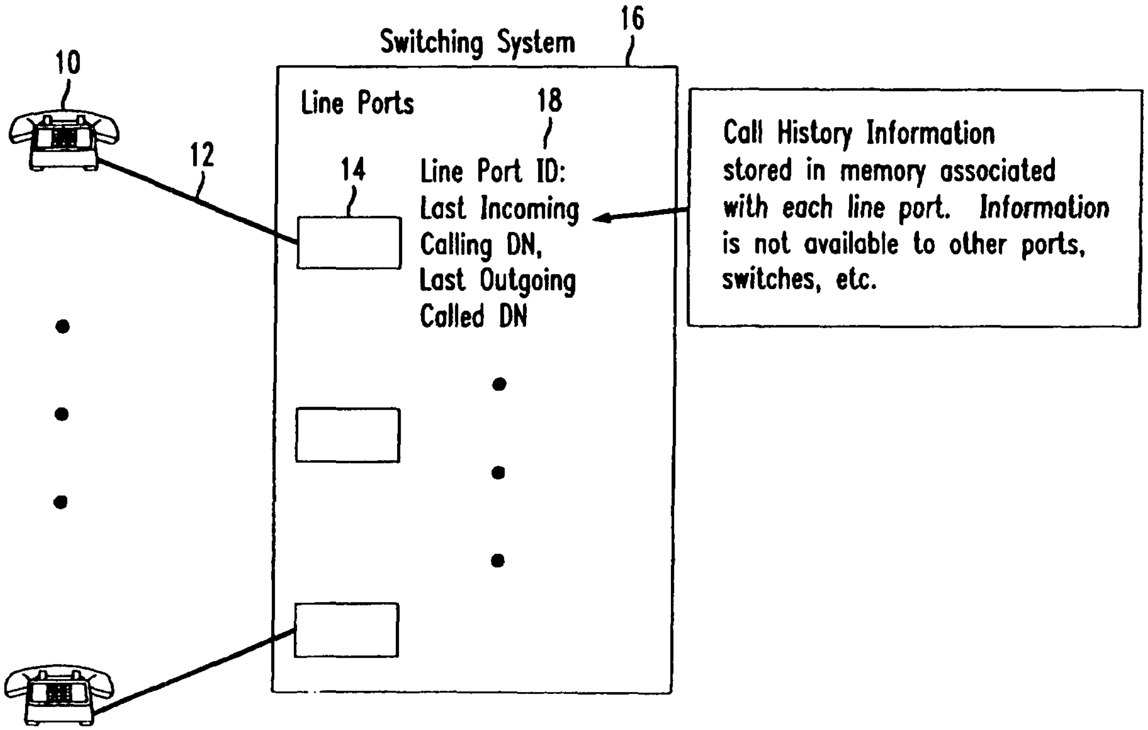

10
12
Switching System
16
Line Ports
14
18
Line Port ID:
Last Incoming
Calling DN,
Last Outgoing
Called DN
Call History Information
stored in memory associated
with each line port. Information
is not available to other ports,
switches, etc.

FIG. 2

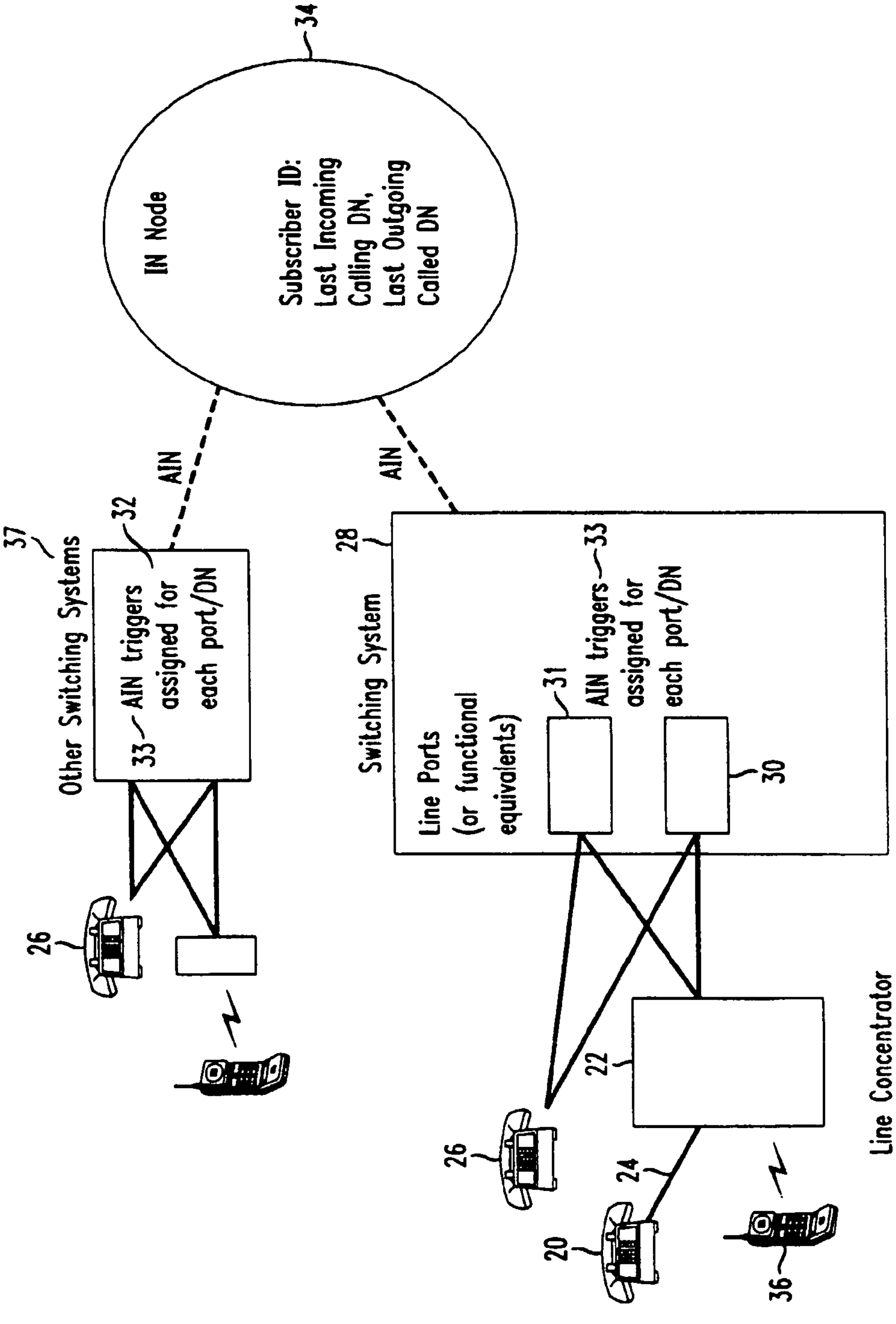
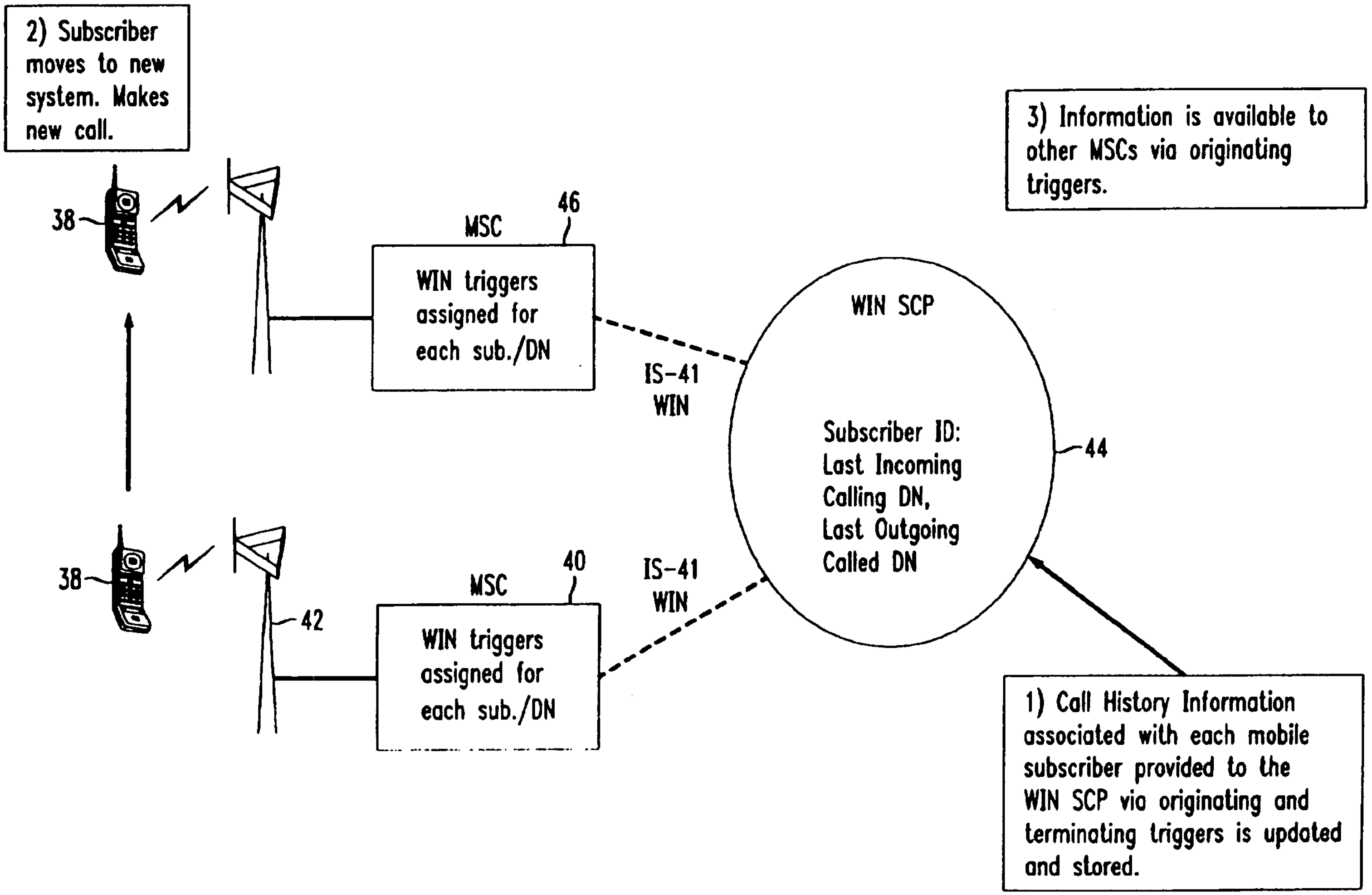

34
IN Node
Subscriber ID:
Last Incoming
Calling DN,
Last Outgoing
Called DN
AIN
AIN
37
Other Switching Systems
32
33
AIN triggers
assigned for
each port/DN
26
28
Switching System
33
AIN triggers
assigned for
each port/DN
31
Line Ports
(or functional
equivalents)
30
22
Line Concentrator
e.g., RDT, WDLC,
Generic C RPCU,
26
24
20
36

FIG. 3


38
38
42
MSC
46
WIN triggers assigned for each sub./DN
MSC
40
WIN triggers assigned for each sub./DN
IS-41 WIN
IS-41 WIN
WIN SCP
Subscriber ID: Last Incoming Calling DN, Last Outgoing Called DN
44

1) Call History Information associated with each mobile subscriber provided to the WIN SCP via originating and terminating triggers is updated and stored.

2) Subscriber moves to new system. Makes new call.

3) Information is available to other MSCs via originating triggers.

FIG. 4

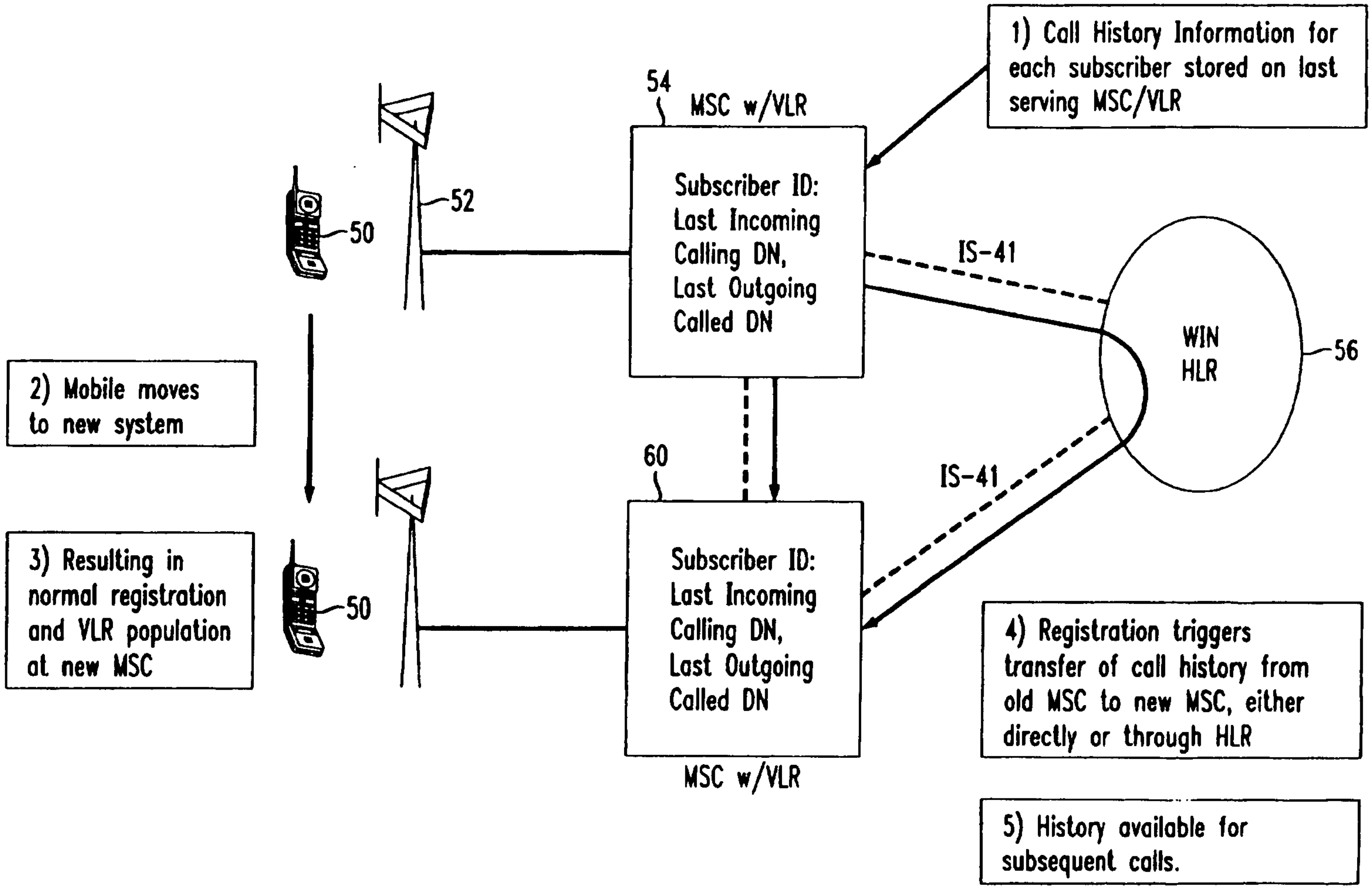

1) Call History Information for each subscriber stored on last serving MSC/VLR
54
MSC w/VLR
Subscriber ID:
Last Incoming
Calling DN,
Last Outgoing
Called DN
52
50
IS-41
WIN
HLR
56
2) Mobile moves to new system
60
IS-41
3) Resulting in normal registration and VLR population at new MSC
50
Subscriber ID:
Last Incoming
Calling DN,
Last Outgoing
Called DN
MSC w/VLR
4) Registration triggers transfer of call history from old MSC to new MSC, either directly or through HLR
5) History available for subsequent calls.

FIG. 5

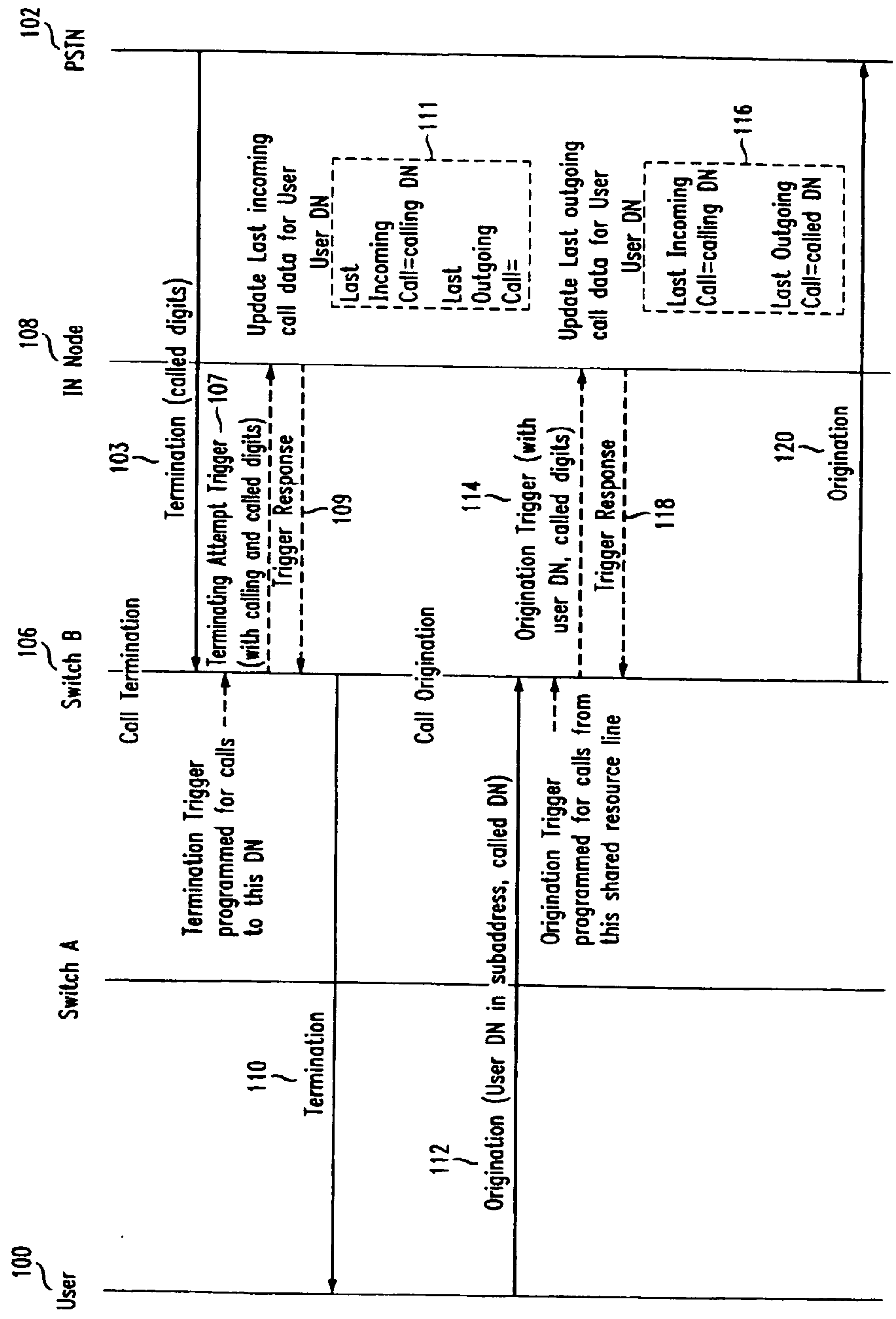

100
User
Switch A
106
Switch B
108
IN Node
102
PSTN
Call Termination
103
Termination (called digits)
Terminating Attempt Trigger —107
(with calling and called digits)
Trigger Response
109
Update Last incoming call data for User
User_DN
Last Incoming Call=calling DN
Last Outgoing Call=
111
Termination Trigger programmed for calls to this DN
110
Termination
Call Origination
112
Origination (User DN in subaddress, called DN)
Origination Trigger programmed for calls from this shared resource line
114
Origination Trigger (with user DN, called digits)
Trigger Response
118
Update Last outgoing call data for User
User_DN
Last Incoming Call=calling DN
Last Outgoing Call=called DN
116
120
Origination

FIG. 6

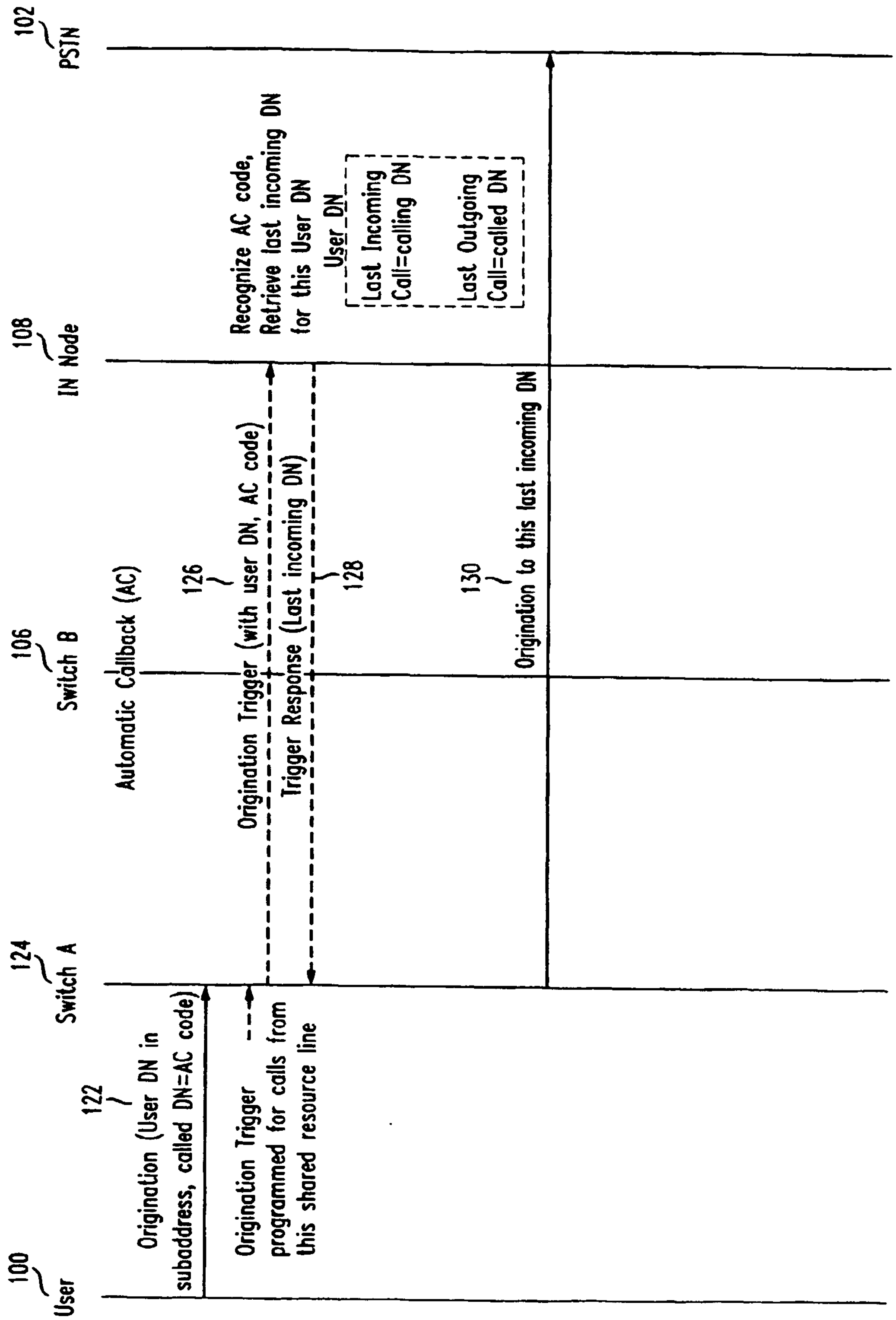

100
User
124
Switch A
106
Switch B
108
IN Node
102
PSTN
Automatic Callback (AC)
122
Origination (User DN in subaddress, called DN=AC code)
Origination Trigger programmed for calls from this shared resource line
126
Origination Trigger (with user DN, AC code)
128
Trigger Response (Last incoming DN)
Recognize AC code, Retrieve last incoming DN for this User DN
User_DN
Last Incoming Call=calling DN
Last Outgoing Call=called DN
130
Origination to this last incoming DN

FIG. 7

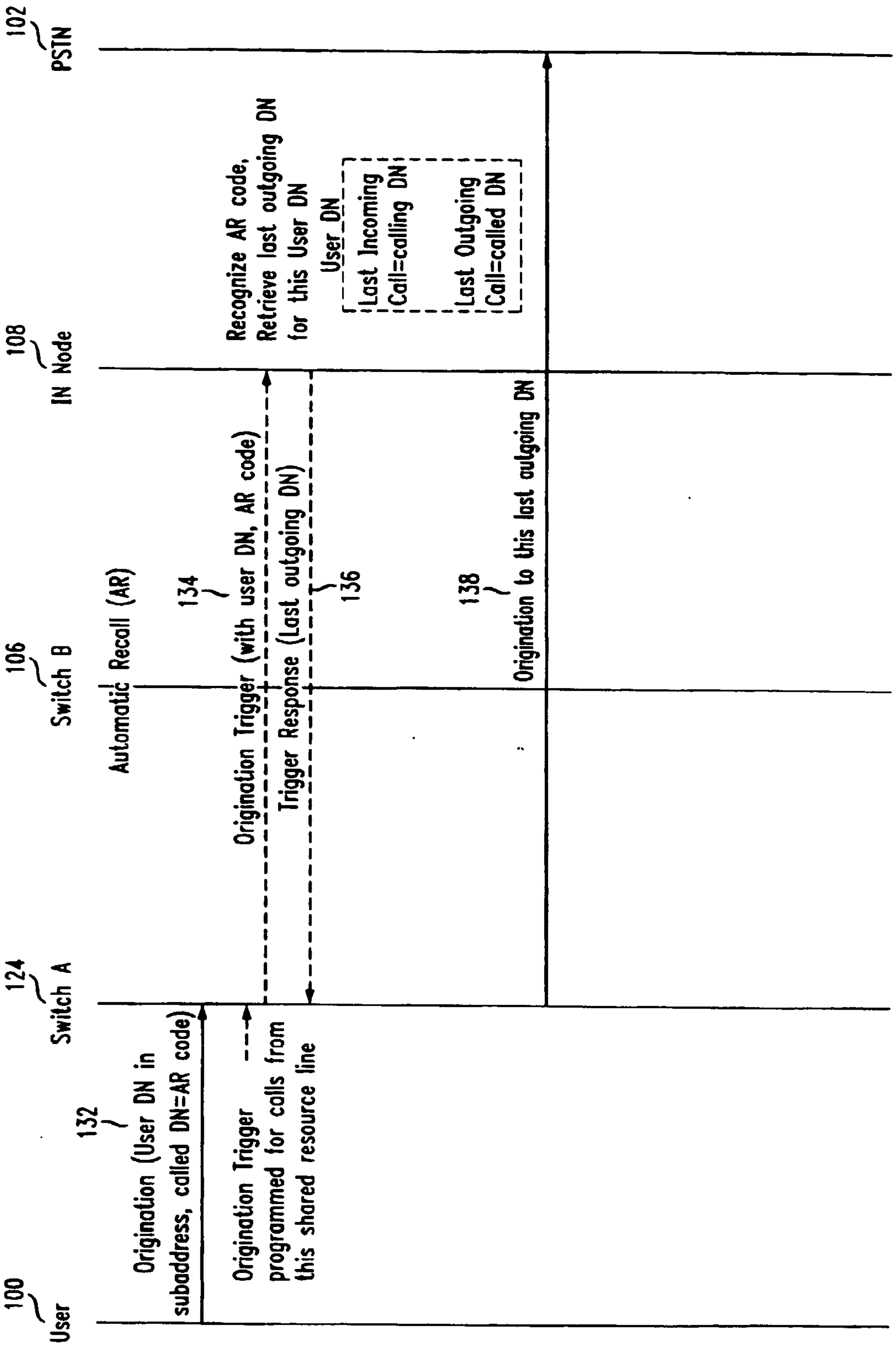

100
User
124
Switch A
106
Switch B
108
IN Node
102
PSTN
Automatic Recall (AR)
132
Origination (User DN in subaddress, called DN=AR code)
Origination Trigger programmed for calls from this shared resource line
134
Origination Trigger (with user DN, AR code)
136
Trigger Response (Last outgoing DN)
Recognize AR code, Retrieve last outgoing DN for this User DN
User DN
Last Incoming Call=calling DN
Last Outgoing Call=called DN
138
Origination to this last outgoing DN

FIG. 8

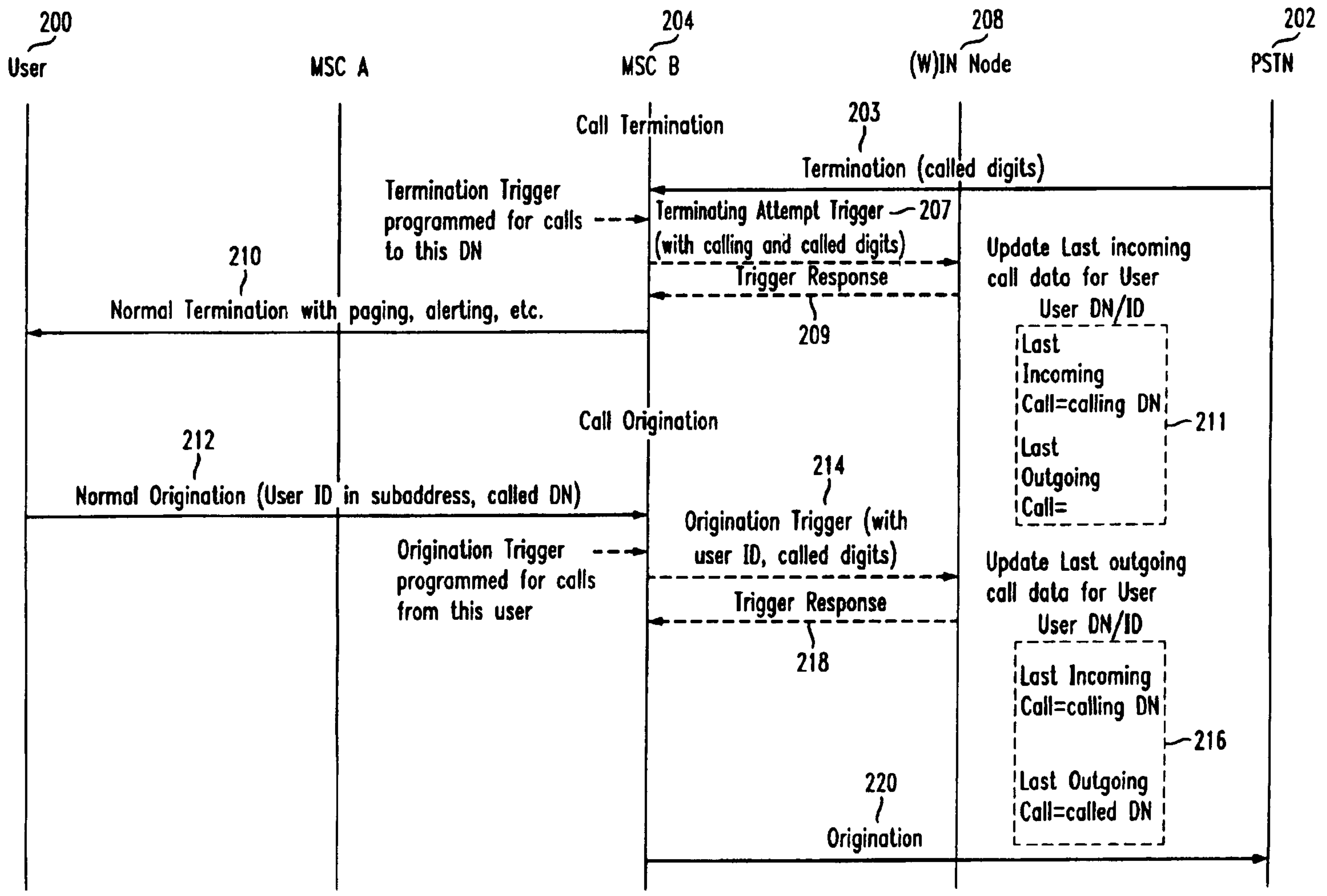

200
User
MSC A
204
MSC B
208
(W)IN Node
202
PSTN
Call Termination
203
Termination (called digits)
Termination Trigger programmed for calls to this DN
Terminating Attempt Trigger
207
(with calling and called digits)
Trigger Response
209
210
Normal Termination with paging, alerting, etc.
Update Last incoming call data for User
User DN/ID
Last Incoming Call=calling DN
Last Outgoing Call=
211
Call Origination
212
Normal Origination (User ID in subaddress, called DN)
214
Origination Trigger (with user ID, called digits)
Origination Trigger programmed for calls from this user
Trigger Response
218
Update Last outgoing call data for User
User DN/ID
Last Incoming Call=calling DN
Last Outgoing Call=called DN
216
220
Origination

FIG. 9

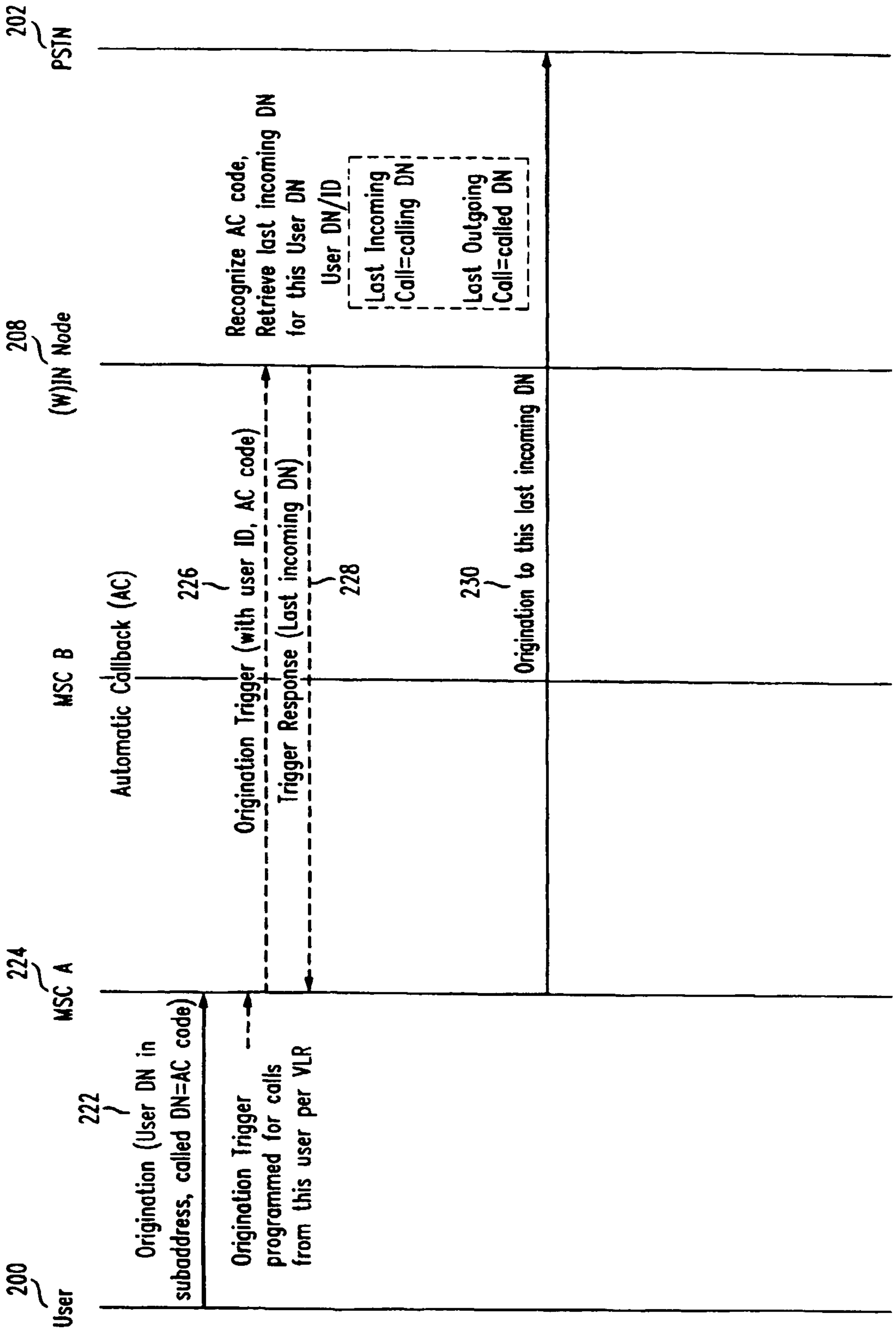

200
User
224
MSC A
MSC B
208
(W)IN Node
202
PSTN
Automatic Callback (AC)
222
Origination (User DN in subaddress, called DN=AC code)
Origination Trigger programmed for calls from this user per VLR
226
Origination Trigger (with user ID, AC code)
228
Trigger Response (Last incoming DN)
Recognize AC code, Retrieve last incoming DN for this User DN
User DN/ID
Last Incoming Call=calling DN
Last Outgoing Call=called DN
230
Origination to this last incoming DN

FIG. 10

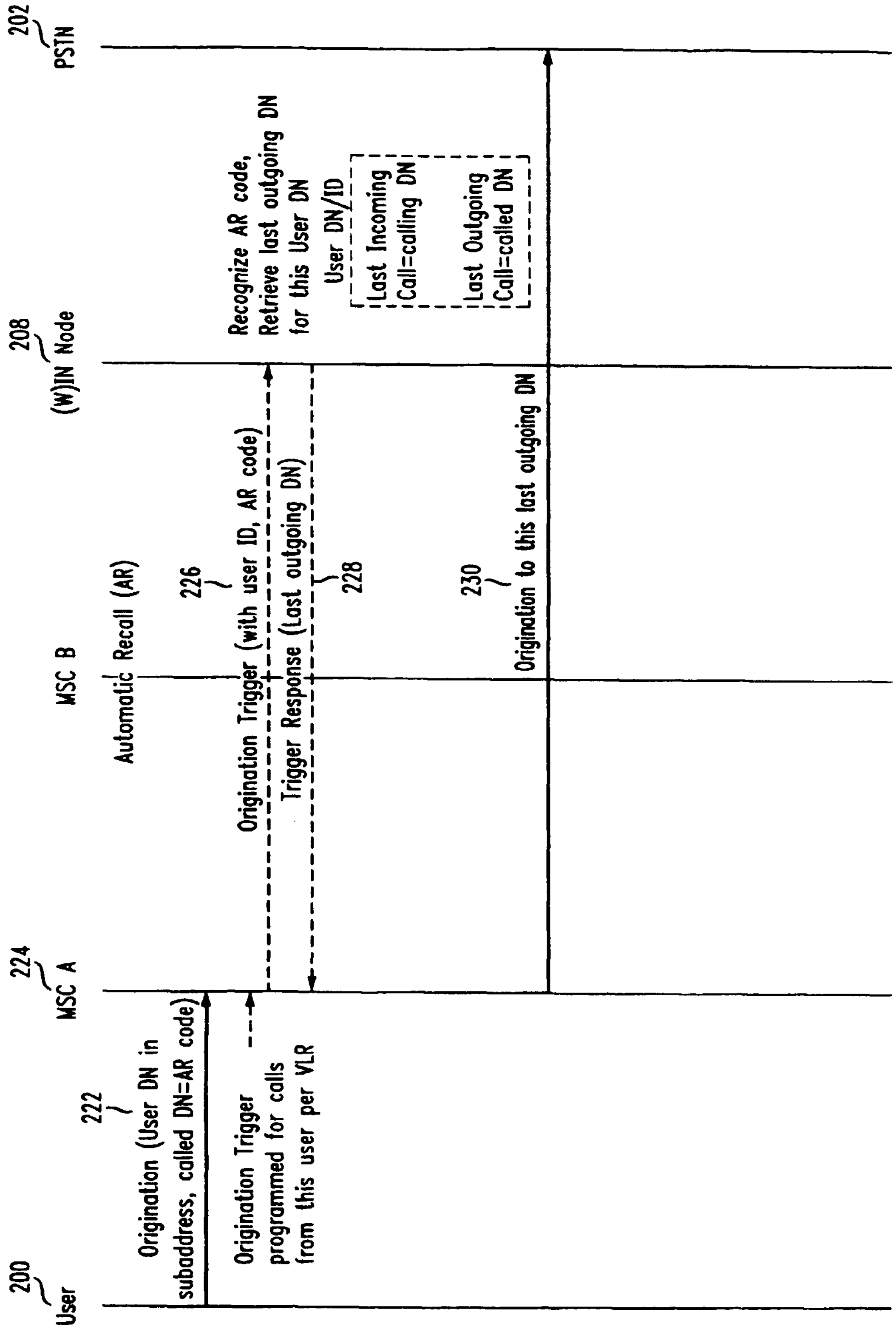

200
User
222
Origination (User DN in subaddress, called DN=AR code)
Origination Trigger programmed for calls from this user per VLR
224
MSC A
MSC B
Automatic Recall (AR)
226
Origination Trigger (with user ID, AR code)
228
Trigger Response (Last outgoing DN)
230
Origination to this last outgoing DN
208
(W)IN Node
Recognize AR code, Retrieve last outgoing DN for this User DN
User DN/ID
Last Incoming Call=calling DN
Last Outgoing Call=called DN
202
PSTN

FIG. 11

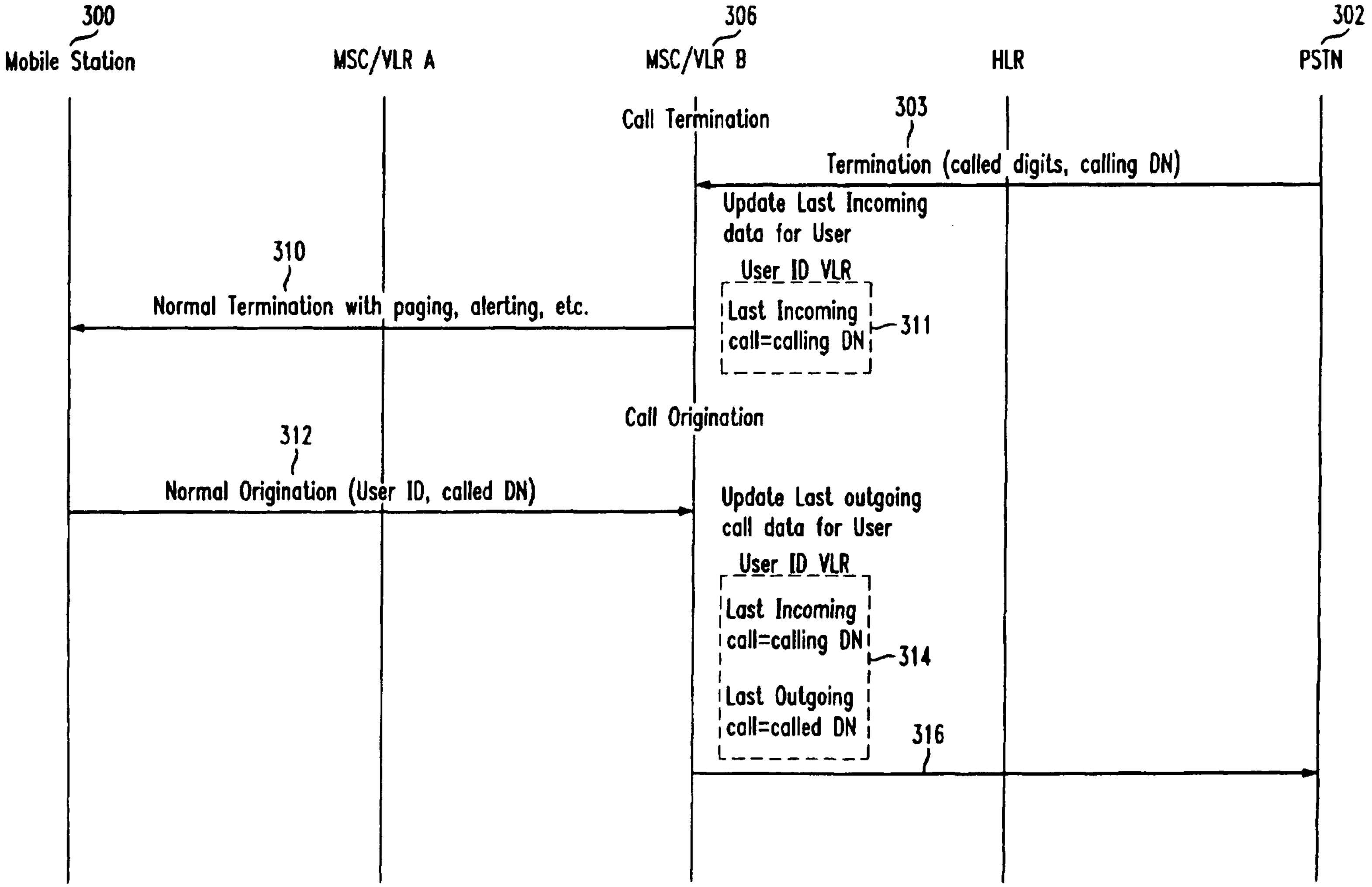
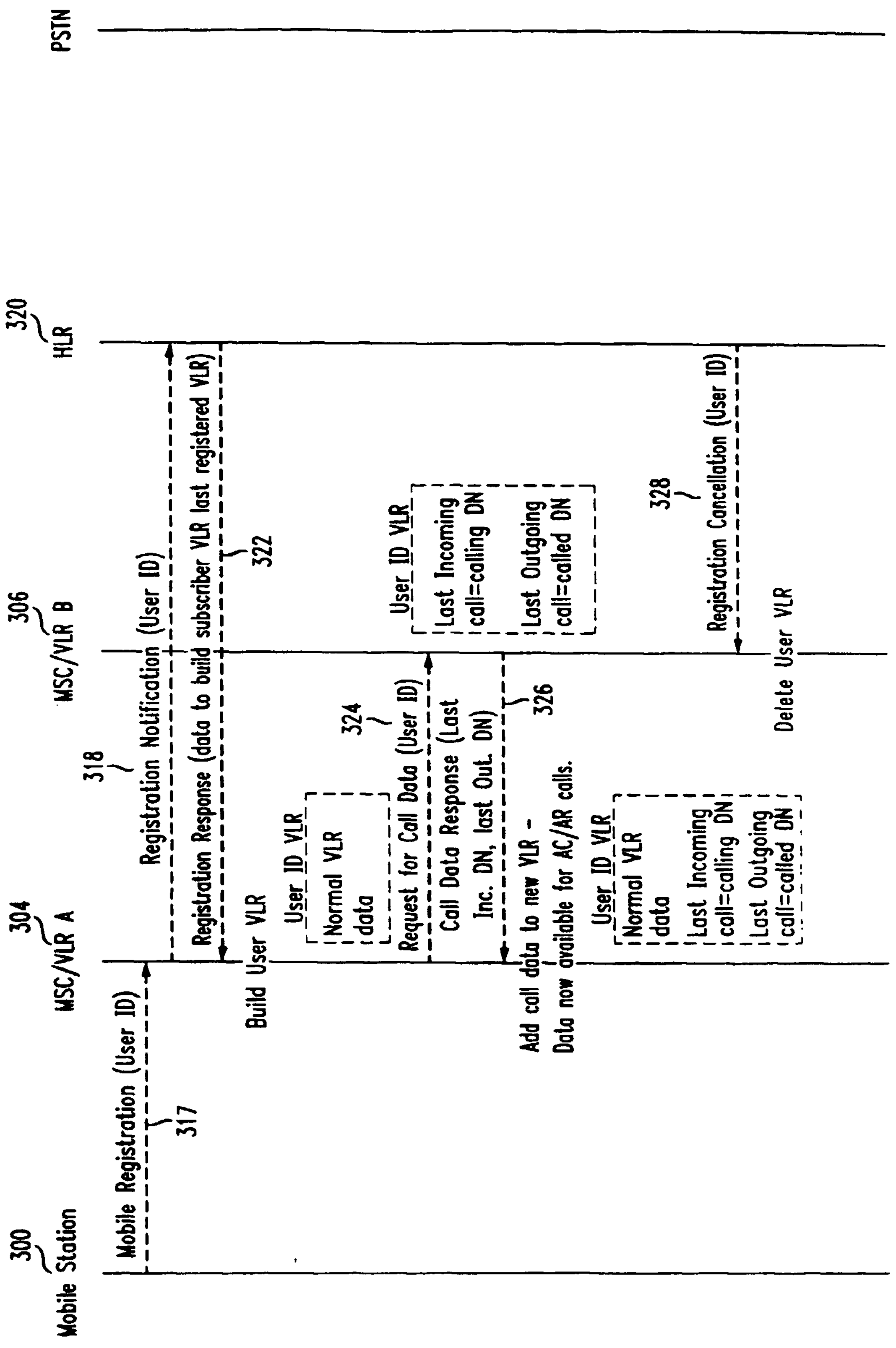

300
Mobile Station
MSC/VLR A
306
MSC/VLR B
HLR
302
PSTN
Call Termination
303
Termination (called digits, calling DN)
Update Last Incoming
data for User
User ID VLR
Last Incoming
call=calling DN
311
310
Normal Termination with paging, alerting, etc.
Call Origination
312
Normal Origination (User ID, called DN)
Update Last outgoing
call data for User
User ID VLR
Last Incoming
call=calling DN
314
Last Outgoing
call=called DN
316

FIG. 12


300
Mobile Station
304
MSC/VLR A
306
MSC/VLR B
320
HLR
PSTN
Mobile Registration (User ID)
317
Registration Notification (User ID)
318
Registration Response (data to build subscriber VLR last registered VLR)
322
Build User VLR
User_ID_VLR
Normal VLR data
Request for Call Data (User ID)
324
Call Data Response (Last Inc. DN, last Out. DN)
326
User_ID_VLR
Last Incoming call=calling DN
Last Outgoing call=called DN
Add call data to new VLR - Data now available for AC/AR calls.
User_ID_VLR
Normal VLR data
Last Incoming call=calling DN
Last Outgoing call=called DN
328
Registration Cancellation (User ID)
Delete User VLR

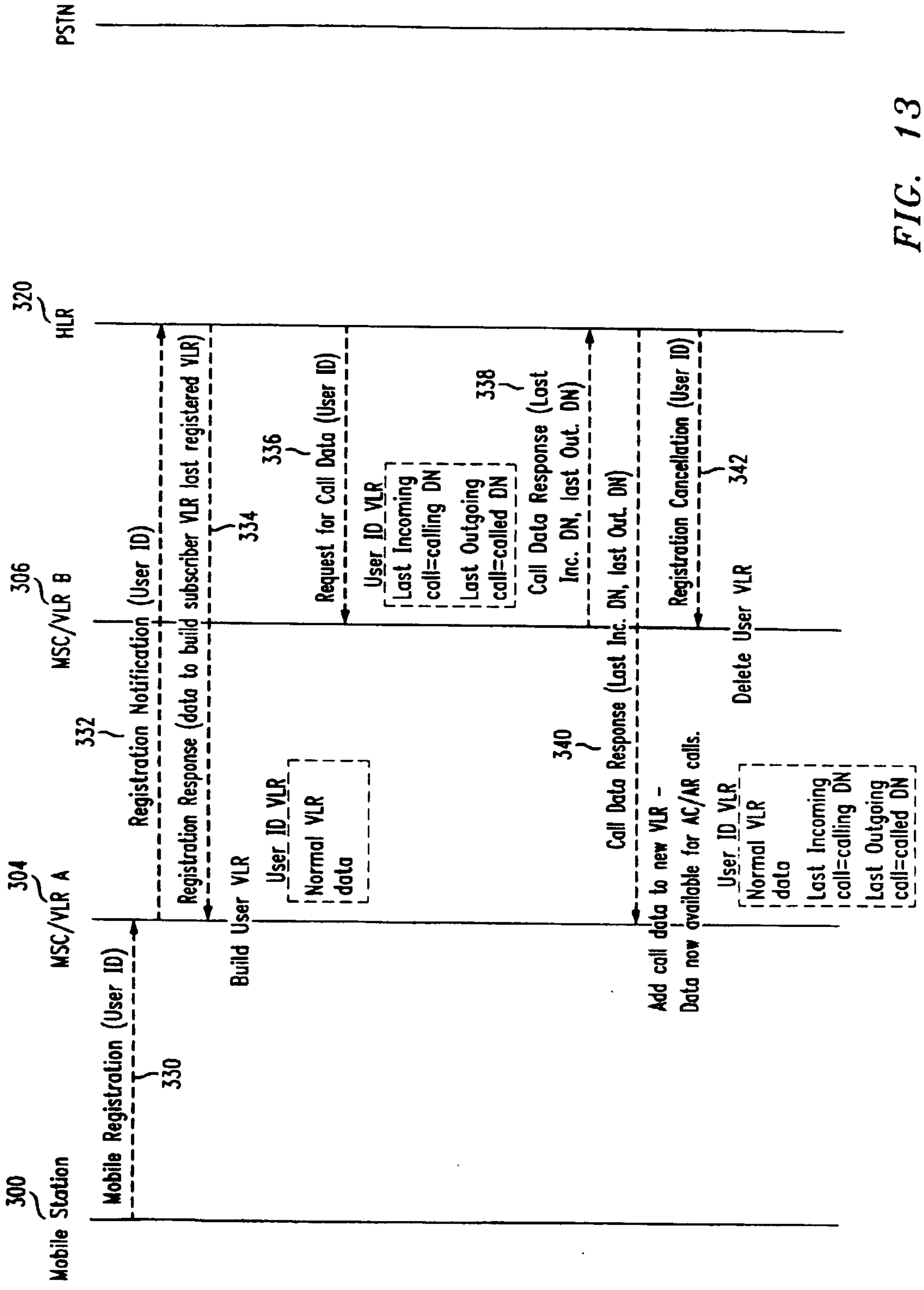

300
Mobile Station
304
MSC/VLR A
306
MSC/VLR B
320
HLR
PSTN
Mobile Registration (User ID)
330
Registration Notification (User ID)
332
Registration Response (data to build subscriber VLR last registered VLR)
334
Build User VLR
User ID VLR
Normal VLR data
Request for Call Data (User ID)
336
User ID VLR
Last Incoming call=calling DN
Last Outgoing call=called DN
Call Data Response (Last Inc. DN, last Out. DN)
338
Call Data Response (Last Inc. DN, last Out. DN)
340
Add call data to new VLR - Data now available for AC/AR calls.
Registration Cancellation (User ID)
342
Delete User VLR
User ID VLR
Normal VLR data
Last Incoming call=calling DN
Last Outgoing call=called DN

FIG. 13

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 967 775 A3

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
19.04.2000 Bulletin 2000/16

(51) Int Cl.⁷: **H04M 3/42**, H04M 3/48,
H04Q 3/00, H04Q 7/38

(43) Date of publication A2:
29.12.1999 Bulletin 1999/52

(21) Application number: **99304671.3**

(22) Date of filing: **15.06.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **23.06.1998 US 103021**

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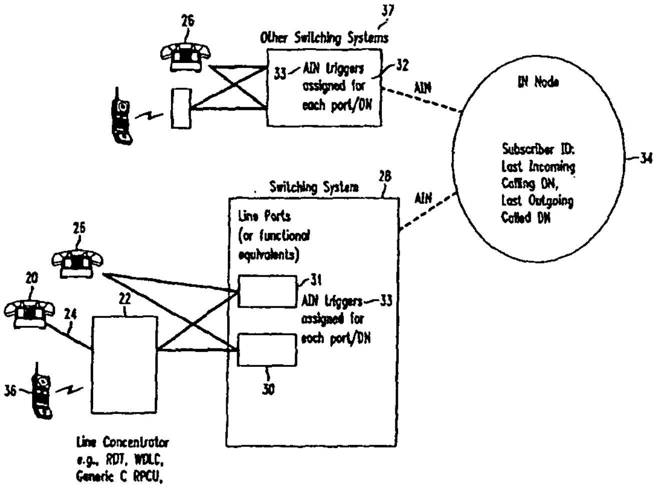
(54) Method and apparatus for tracking call history for mobile and wireline users accessing the network on different ports for subsequent calls

(57) This invention provides a method and apparatus for associating call data with particular users instead of line ports. This call data includes the last incoming and outgoing calls associated with a particular number. This allows the services such as automatic callback, automatic recall, and customer originated trace to be implemented with dynamic line assignment allowing users to maintain the same level of subscribed services at different locations. For mobile users, automatic callback, automatic recall, and customer originated trace can be implemented at the home mobile switching center as well as roaming mobile switching centers. If the mobile user is roaming, updating the call history of the mobile station at the new mobile switching center allows the mobile user to experience seamless services across a large territory.

FIG. 2


26
37
Other Switching Systems
33
AIN triggers assigned for each port/DN
32
AIN
IN Node
Subscriber ID:
Last Incoming Calling DN,
Last Outgoing Called DN
34
Switching System
28
AIN
Line Ports
(or functional equivalents)
26
20
24
22
31
AIN triggers
33
assigned for each port/DN
30
36
Line Concentrator
e.g., RDT, WDLC,
Generic C RPCU,

EP 0 967 775 A3

Printed by Jouve, 75001 PARIS (FR)

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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 4671

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE 40 31 857 A (STANDARD ELEKTRIK LORENZ AG) 9 April 1992 (1992-04-09) * abstract *	5	H04M3/42 H04M3/48 H04Q3/00 H04Q7/38
X	US 4 602 128 A (FREUNDLICH GLEN G) 22 July 1986 (1986-07-22) * abstract *	5	
X	US 5 581 611 A (YUNOKI HIDEO) 3 December 1996 (1996-12-03) * column 4, line 21-55 * * column 5, line 15-53 *	1,7,10	
Y		8	
A	GARG V K ET AL: "SUBSCRIBER DATA MANAGEMENT IN PERSONAL COMMUNICATIONS SERVICES NETWORKS" IEEE PERSONAL COMMUNICATIONS,US,IEEE COMMUNICATIONS SOCIETY, vol. 4, no. 3, 1 June 1997 (1997-06-01), pages 33-39, XP000655314 ISSN: 1070-9916 * page 33, right-hand column, paragraph 2 - page 35, left-hand column, paragraph 1 *	2-4,6,8,9	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04M H04Q
Y	figure 2 Option 2: Network-resident	8	
A	MOULY, MICHEL; PAUTET, MARIE-BERNADETTE: "THE GSM SYSTEM FOR MOBILE COMMUNICATIONS - 7.1 Location Management" , PUBLISHED BY THE AUTHORS XP002129579ISBN: 2-9507190-0-7 * page 470 *	2-4,6,8,9	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 February 2000	Cremer, J

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4031857 A	09-04-1992	CA 2052858 A	09-04-1992
		EP 0480233 A	15-04-1992
		JP 4264867 A	21-09-1992
US 4602128 A	22-07-1986	CA 1238966 A	05-07-1988
		EP 0203147 A	03-12-1986
		ES 549389 A	16-04-1987
		JP 62501531 T	18-06-1987
		KR 9311205 B	25-11-1993
		WO 8603359 A	05-06-1986
US 5581611 A	03-12-1996	JP 5207149 A	13-08-1993
		CA 2088333 A	29-07-1993
		GB 2263845 A,B	04-08-1993

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